02-17-04 Image AF

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:
Ronald L. Panter

Serial No. 09/780,303 Examiner: P.J. Lish

Filed: 02/09/2001 Group Art Unit: 1754

For: APPARATUS AND METHOD FOR MAKING CARBON FIBERS

CERTIFICATE OF EXPRESS MAIL

I hereby certify that this correspondence is being deposited with the United States Postal Service Express Mail No. EV 395901204 US in an envelope addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on February 13, 2004.

Suzanne J. Wills
Suzanne J. Wills

APPEAL BRIEF

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

ATTENTION: **Board of Appeals and Interferences**

Dear Sir:

1. REAL PARTY IN INTEREST

Industrial Technology and Equipment Company

2. RELATED APPEALS AND INTERFERENCES

None

3. STATUS OF CLAIMS

Claims 1-7, 18, and 19 have been allowed.

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al.

Claims 9, 13-17, 20-24, and 27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al. taken with Uchida et al.

Claims 10-12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al. and Uchida et al as applied to claim 9 and further in view of Berkebile et al (US5316654).

Claims 25, 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al. and Uchida et al and further in view of McCullough (US5700573).

Claims 28-38 have been withdrawn from consideration.

4. STATUS OF AMENDMENTS

The examiner has entered all amendments that the applicant has submitted.

5. SUMMARY OF INVENTION

As recited in claim 8, the invention is a method for making carbon fibers. The method includes providing a precursor fiber (36) and a furnace (10) configured to heat the fiber for both stabilization and carbonization of the fiber. See Specification, page 12, lines 12-15 and page 12 line 20 through page 14, line 21. The fiber is then stabilized and carbonized in a single continuous process that includes drawing the fiber continuously through the furnace by engaging and applying a continuous pulling force to the fiber from outside the furnace. Id.

Claim 9 also recited a method for making carbon fibers. As recited in claim nine, the inventive method includes providing an elongated precursor fiber (36) and a plurality of furnaces (10) disposed adjacent one another in a serial side-by-side relationship, the furnaces being configured to heat the fiber to different respective temperatures as the fiber is drawn through the furnaces. See, e.g., Figure 2; Specification, page 8, lines 32-33 and page 14, line 22 through page 18, line 17. The precursor fiber is stabilized by heating the precursor fiber in an oxidizing environment as it is drawn through respective heating chambers (60, 62, 64, 66, 68, 70 . . .) of an initial group of the plurality of furnaces while applying tension to the precursor fiber. Id. The stabilized fiber is then continuously carbonized by further heating the fiber in an oxidizing environment as it is drawn through the heating chamber of a final one of the plurality of furnaces. Id.

6. ISSUES

Issue 1: Is claim 8 unpatentable over Pepper et al?

Issue 2: Are claims 9, 13-17, 20-24, and 27 unpatentable over Pepper et al. taken with Uchida et al?

Issue 3: Are claims 10-12 unpatentable over Pepper et al. and Uchida et al as applied to claim 9 and further in view of Berkebile et al?

Issue 4: Are claims 25 and 26 unpatentable over Pepper et al. and Uchida et al and further in view of McCullough?

7. GROUPING OF CLAIMS

The grounds of rejection apply to four groups of claims as follows:

Group I: method claim 8;
Group II: method claims 9, 13-17, 20-24, and 27;
Group III: method claims 10-12; and
Group IV: method claims 25 and 26.

8. ARGUMENT (ISSUE 1)

The examiner has rejected claim 8 under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al. According to the examiner, Pepper et al. disclose the claimed process for making carbon fibers except for providing a furnace that includes both a carbonization heating zone and a stabilization heating zone and it would have been obvious to relocate the Pepper et al. carbonization heating zone inside the Pepper et al. furnace that includes stabilization heating zones "to save space and capital costs". The Examiner's position is that using a single furnace for both stabilization and carbonization would be obvious because, according to the examiner, "the rearrangement of locations of parts is obvious to one of ordinary skill." See 15 Aug 2003 OA (Paper #10). As support for this rule the examiner cites *In re* Japikse, 86 USPQ 70.

A more complete statement of the holding in *In re* Japikse is that that there's no invention in shifting the position of a part if *the operation of the device* would not be thereby modified. In view of this, the applicant's initial response to the examiner's line of reasoning was that the *In re* Japikse rule doesn't apply under the present facts. This is because shifting the carbonization heating zone into the same furnace as the stabilization heating zone necessitates changes both in the claimed process and in the operation of the furnace. In addition, it's not just a "part" that's being moved, but the location of an entire step in a process. The examiner responded to this initial argument by stating that "the relocation of the carbonization heating zone from one furnace to another does not change *the process of carbonization*." Id.

In response to this, the applicant has argued that the holding of *In re* Japikse doesn't require that *every* process recited in a claim, e.g., the process of carbonization, must be changed by the relocation of a part. Even if claim 8 *doesn't* recite a change in the process of carbonization itself, the consolidation of stabilization and carbonization processes into a single furnace does represent a significant change in the overall method for making carbon fibers that the claim recites. The claimed method includes the process of carbonization, but also includes providing a precursor fiber, providing a furnace configured to heat the fiber for both stabilization and carbonization of the fiber, and stabilizing and carbonizing the fiber in a single continuous process that includes drawing the fiber continuously through the furnace by engaging and applying a continuous pulling force to the fiber from outside the furnace. This overall claimed process represents a significant and commercially important change from processes disclosed in the prior art. Rather than simply relocating an electrical switch that merely ***initiates*** a process as in *In re* Japikse, the claimed process consolidates stabilization and carbonization processes into a single furnace.

In addition, *In re* Japikse doesn't require a change of process. Once again, what the *In re* Japikse board held was that there's no invention in shifting the position of a part if *the operation of the device* would not be thereby modified. Here, even if

the process of carbonization hasn't changed, the operation of the device has. Consolidating stabilization and carbonization in a single furnace IS a change in the *operation of the device* because it changes how the device operates. Having adapted a furnace to perform an additional process, one could not accurately say that the operation of the furnace has not changed. The furnace ***was*** used just to stabilize fibers. Now it stabilizes ***and*** carbonizes.

There's no indication that the Board in *In re* Japikse intended that it's holding be used to justify rejections of claims whenever such claims depend for novelty on the repositioning of a process relative to the prior art. While part or process relocations may consistently bring *In re* Japikse to an examiner's mind, it doesn't mean that the rule in *In re* Japikse will always apply or that the relocation of parts or processes can never provide a novel and non-obvious structure or method. It would be inappropriate to extend *In re* Japikse to all situations where, as here, a relocated process hasn't changed. Just because a relocated process hasn't changed doesn't mean that its relocation hasn't changed the operation of the device.

Neither is there any indication that the Board in *In re* Japikse intended that it's holding be used as a *per se* rule of patentability. *Even if* it could reasonably be said that the operation of the device isn't modified by consolidating stabilization and carbonization in a single furnace, "[t]he mere fact that a worker in the art could rearrange the parts of the reference device to meet the terms of the claims on appeal is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for the worker in the art, without the benefit of appellant's specification, to make the necessary changes in the reference device." *Ex parte* Chicago Rawhide Mfg. Co., 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984). The Office Action identifies no such motivation.

The examiner responded to one of the applicant's arguments above by stating that "the relocating of the heating zone does not represent a change in its operation, rather it represents a relocation into a larger enclosed structure." See Advisory Action at page 2. However, the applicant's argument that the examiner appears to be referring to was ***not*** that the relocation of a heating zone represents a change in the heat zone's operation. Instead, the applicant argued that the operation of the entire ***furnace*** has changed to carbonize, as well as stabilize fibers. Therefore, there is no obviousness under *In re* Japikse.

Referring to another of the applicant's arguments, the examiner responds that no change "in operation" is shown, that "it is merely claimed that now a single enclosed structure provides both operations." Id. Here, the examiner has focused the inquiry on whether there has been a change "in operation" rather than in "the operation of the device" as *In re* Japikse requires. The applicant maintains that it is improper to narrow the inquiry to focus on a single operation, e.g., stabilization or carbonization,

that arguably hasn't changed, when the proper inquiry should focus on whether the change modifies the overall operation *of the device*. Again, consolidating stabilization and carbonization ***does*** represent a change in the operation of the device and there is no obviousness under *In re* Japikse.

9. ARGUMENT (ISSUE 2)

The examiner has rejected claims 9, 13-17, 20-24, and 27 under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al. taken with Uchida et al.

Pepper discloses a ***stabilization*** process accomplished using a series of separate furnaces with one or more heating zones. Uchida discloses ***carbonization in an oxidizing process***. The examiner says it would be obvious to combine the two and arrive at the invention of claim 9 (carbonization in an oxidizing process using a series of separate furnaces) because Pepper et al. disclose a stabilization process that may be accomplished using "a series of separate furnaces with one or more heating zones" as recited in claim 9.

The applicant has argued, in response, that to establish a *prima facie* case for obviousness, the examiner must identify either an explicit teaching or at least an implicit suggestion to modify or combine the teachings of the two references. See, *e.g.*, *In re Oetiker*, 24 USPQ2d 1443, 1446-1447 (Fed. Cir. 1992). The examiner, having been unable to identify an explicit teaching to combine these references, has instead identified what he describes as an implicit motivation: "to lower costs by eliminating the need for an additional gas supply." Advisory Action, page 2. The applicant maintains that, rather than showing an implicit suggestion or motivation, the examiner has merely identified an *advantage* that the combination would realize. Identifying an advantage merely shows that, in hindsight, there's an advantage to combining the elements. It does not show an implicit suggestion. If it did, if all that were necessary were to identify an advantage that a combination provides, then almost all patents would be invalid. That's why the Federal Circuit requires that, to show an implicit motivation, an examiner must consider whether one skilled in the art would know to use an existing teaching to solve another problem that's the same as or similar to the problem that the teaching addresses. *Id.* In other words, when there is no explicit suggestion, then, to show that there's an implicit suggestion, the Examiner must show that one skilled in the art would know to use a prior art teaching to solve the problem that the Applicant seeks to solve through the invention in question. For this to be the case, the problem that the invention solves must be the same as or similar to the problem that the prior art teaching solves. See *Id.*

In a telephone interview conducted 21 January 2004, I asked for the examiner's position on whether the problem that the invention solves is the same as or at least similar to the problem that the prior art teaching solves. Before beginning the telephone interview, I forwarded to the examiner the applicant's position with regard to this issue: that the problem that the invention of claim 9 solves by using the combination of a series of separate furnaces and an oxidizing atmosphere, is the problem of how to provide a

continuous precursor fiber ***carbonizing*** process (rather than a batch process). App. p.3, lines 16-18. The problem that the Pepper proposes to solve with a series of separate furnaces is the problem of how "to establish a series of temperature stages" (Col. 6, lines 3-5). This is offered as an alternative to a multi-zone gradient furnace in an already continuous process – so the reference doesn't suggested it as a way to solve the problem of how to make a non-continuous process continuous. Uchida mentions carbonization (calcinations) in an oxidizing atmosphere only as an alternative way to solve the problem of how to carbonize carbon performs (Col. 6, lines 9-12). The applicant maintains that, although claim 9 incorporates each of these concepts, the problems that the prior art features solve are neither the same nor similar to the problem of how to continuously carbonize precursor fiber. As such, there is no implicit motivation and, under *In re Oetiker*, there is no basis for a finding of obviousness.

In response, the examiner's supervisor, who was present with the examiner for the telephone interview, rather than providing an alternative analysis based on *In re Oetiker,* denied that the examiner was required to follow the test in *In re Oetiker*. The examiner's supervisor cited In re Dillon 16 USPQ2d. 1897 (Fed. Cir. 1990)(en banc) as standing for the proposition that, contrary to In re Oetiker's holding, the prior art doesn't need to solve the applicant's problem to show an implicit motivation to combine. When I asked whether he was contending that In re Dillon reversed In re Oetiker, the Examiner's supervisor said no, but that "these decisions are all over the map" and they, as examiners, just had to select whichever case supports their position. I suggested that, by abandoning what appears to be a more objective test for determining whether there's an implicit suggestion, the examiner's supervisor has opted for a system where examiners just go with their subjective gut feelings as to whether a combination would have been obvious.

In addition, the applicant notes that *In re Dillon* pre-dates *In re Oetiker*. As such, the applicant understands the principle of *stare decisis* in this situation to preclude an examiner from relying on even an *en banc* decision of the Federal Circuit to nullify a Federal Circuit holding in a subsequent case (*In re Oetiker*). Still further, having reviewed the Federal Circuit's *en banc* decision *In re Dillon*, I can find nothing that contradicts the rule the Federal Circuit later established in *In re Oetiker*. In fact, in *In re Dillon*, the court clearly states that it "reaffirms that structural similarity between claimed and prior art subject matter, proved by combining references or otherwise, where the prior art gives reason or motivation to make the claimed compositions, creates a *prima facie* case of obviousness . . ." *In re Dillon* at 1901. This statement harmonizes easily with the subsequently developed rule in *In re Oetiker* regarding how an examiner should go about showing that there is an implicit motivation to combine, i.e., by evaluating whether the problem that the invention solves is the same as or similar to the problem that the prior art teaching solves.

10. ARGUMENT (ISSUE 3)

The examiner has rejected claims 10-12 as being unpatentable over Pepper et al. and Uchida et al as applied to claim 9 and further in view of Berkebile et al. The applicant maintains that claims 10-12 are allowable because they depend from an allowable base claim.

11. ARGUMENT (ISSUE 4)

The examiner has rejected claims 25, 26 as being unpatentable over Pepper et al. and Uchida et al and further in view of McCullough. The applicant maintains that claims 25 and 26 are allowable because they depend from an allowable base claim.

A check for $1,280 to cover the appeal brief fee is enclosed. However, the Commissioner is authorized to charge any fee or credit any overpayment in connection with this communication to our Deposit Account No. 50-0852. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

REISING, ETHINGTON, BARNES, KISSELLE, P.C.

Eric T. Jones, Reg. No. 40,037
Attorney of Record
P.O. Box 4390
Troy, Michigan 48099-4390
(248) 689-3500

Date: February 13, 2004

12. APPENDIX

1. A method for making carbon fibers, the method including the steps of:

providing a precursor fiber;

providing a furnace configured to heat the fiber;

stabilizing the precursor fiber by heating the precursor fiber in an oxidizing environment in a heating chamber of the furnace while applying tension to the precursor fiber;

carbonizing the stabilized fiber by further heating the fiber in an oxidizing environment in the heating chamber of the furnace.

2. The method of claim 1 in which the steps of stabilizing and carbonizing each include:

continuously introducing ambient air into the furnace;

heating the air; and

blowing the heated air over the fiber in the heating chamber of the furnace.

3. The method of claim 1 in which the step of stabilizing includes:

initially heating the precursor fiber until reaching a heating chamber temperature of between approximately 174 and 185 degrees Celsius;

holding the heating chamber at this temperature for approximately 5 minutes until the material begins to stabilize;

after the precursor material begins to stabilize, raising the heating chamber temperature approximately 1.7-2.8 degrees Celsius per minute to approximately 204 degrees

Celsius by increasing the temperature of the heated air being blown into the heating chamber; then

gradually raising the heating chamber temperature from approximately 204 degrees Celsius to approximately 227 to 232 degrees Celsius by increasing the temperature of the heated air being blown into the heating chamber at a rate sufficient for stabilization but insufficient for carbonization; and

the step of carbonizing includes:

quickly raising the heating chamber temperature to approximately 399 degrees Celsius by increasing the temperature of the air being introduced into the heating chamber at a rate that will carbonize the fiber.

4. The method of claim 1 in which the step of carbonizing includes carbonizing the fibers such that each resulting fiber is a biregional fiber that includes an inner non-carbonized core and an exterior carbonized sheath.

5. The method of claim 4 in which:

the step of providing precursor fibers includes providing a homogeneous polymeric material;

the step of stabilizing includes oxygen stabilizing an outer fiber portion of the polymeric material; and

the step of carbonizing includes forming a carbonized outer region and a non-carbonized inner region of each fiber.

6. The method of claim 5 in which the step of providing a homogeneous polymeric material includes providing a standard acrylic polymer.

7. The method of claim 1 in which the step of providing a precursor fiber includes providing a polyacrylonitrile (PAN) fiber.

8. A method for making carbon fibers, the method including the steps of:

providing a precursor fiber;

providing a furnace configured to heat the fiber for both stabilization and carbonization of the fiber; and

stabilizing and carbonizing the fiber in a single continuous process that includes drawing the fiber continuously through the furnace by engaging and applying a continuous pulling force to the fiber from outside the furnace.

9. A method for making carbon fibers, the method including the steps of:

providing an elongated precursor fiber;

providing a plurality of furnaces disposed adjacent one another in a serial side-by-side relationship and configured to heat the fiber to different respective temperatures as the fiber is drawn through the furnaces;

stabilizing the precursor fiber by heating the precursor fiber in an oxidizing environment as it is drawn through respective heating chambers of an initial group of the

plurality of furnaces while applying tension to the precursor fiber; and

continuously carbonizing the stabilized fiber by further heating the fiber in an oxidizing environment as it is drawn through the heating chamber of a final one of the plurality of furnaces.

10. The method of claim 9 in which the step of stabilizing the precursor fiber includes:

heating the heating chamber of a first one of the plurality of furnaces to a first temperature;

heating the heating chamber of each subsequent furnace to a temperature higher than each respective preceding furnace;

heating the heating chamber of one of the furnaces to a temperature less than and approximating the flash point of the precursor fiber being stabilized; and

drawing the fiber through the heating chambers of the furnaces starting with the heating chamber of the first furnace.

11. The method of claim 10 in which the step of providing a plurality of furnaces includes configuring the furnaces such that the fiber is exposed to a temperature just below and approximating the flash point of the fiber for a longer period of time than the fiber spends at the other temperatures.

12. The method of claim 11 in which the step of providing a plurality of furnaces includes:

providing an additional furnace adjacent the furnace that is heated to a

temperature just below the flash point of the precursor fiber being stabilized;

heating the additional furnace to a temperature just below and approximating the flash point of the precursor fiber being stabilized; and

drawing the fiber through the furnaces such that the fiber passes through the heating chamber of the additional furnace after leaving the heating chamber of the furnace that is heated to just below and approximating the flash point of the fiber.

13. The method of claim 9 in which the step of carbonizing the fiber includes:

heating the heating chamber of a final one of the furnaces to a temperature that will carbonize at least a portion of the fiber; and

drawing the fiber through the heating chamber of the final furnace.

14. The method of claim 9 in which:

the step of providing a plurality of furnaces includes providing seven furnaces connected in series; and

the step of stabilizing the precursor fiber includes:

heating the heating chamber of the first furnace to approximately 185 degrees Celsius;

heating the heating chamber of the second furnace to approximately 193 degrees Celsius;

heating the heating chamber of the third furnace to approximately 204 degrees Celsius;

heating the heating chamber of the fourth furnace to approximately 216 degrees Celsius;

heating the heating chambers of the fifth and sixth furnaces to approximately 232 degrees Celsius; and

drawing the fiber through the heating chambers of the first, second, third, fourth, fifth, sixth, and seventh furnaces in sequence.

15. The method of claim 14 in which the step of carbonizing the fiber includes:

heating the heating chamber of the seventh furnace to approximately 260 degrees Celsius; and

drawing the fiber through the heating chamber of the seventh furnace.

16. The method of claim 14 including the additional step of drawing the fiber through the furnace heating chambers at a rate that provides a residence time in each furnace of approximately 0.6 minutes.

17. The method of claim 15 including the additional step of introducing ambient air into each furnace.

18. A method for making carbon fibers, the method including the steps of:

providing an elongated precursor fiber;

providing at least seven furnaces disposed adjacent one another in a serial

side-by-side relationship, connected in series, and configured to heat the fiber to different respective temperatures as the fiber is drawn through the furnaces;

introducing ambient air into each furnace;

heating the heating chamber of the first furnace to approximately 185 degrees Celsius;

heating the heating chamber of the second furnace to approximately 193 degrees Celsius;

heating the heating chamber of the third furnace to approximately 204 degrees Celsius;

heating the heating chamber of the fourth furnace to approximately 216 degrees Celsius;

heating the heating chambers of the fifth and sixth furnaces to approximately 232 degrees Celsius; and

stabilizing the precursor fiber by heating the precursor fiber in an oxidizing environment as it is drawn through the respective heating chambers of the first, second, third, fourth, fifth, and sixth furnaces in sequence while applying tension to the precursor fiber;

heating the heating chamber of the seventh furnace to approximately 260 degrees Celsius;

continuously carbonizing the stabilized fiber by further heating the fiber in an oxidizing environment as it is drawn through the heating chamber of the seventh furnace; and

adjusting downward the amount of ambient air introduced into furnaces that

are operating at and above approximately 232 degrees Celsius.

19. The method of claim 18 including the additional step of restricting the airflow in furnaces operating at and above 232 degrees Celsius to approximately 60 percent (by volume) of the airflow in the furnaces operating below 232 degrees Celsius.

20. The method of claim 9 including the additional step of further graphitizing the fiber by adding additional furnaces operating at higher temperatures.

21. The method of claim 9 including the additional step of adjusting fiber draw rate to optimize the stabilization and carbonization processes.

22. The method of claim 9 in which:

the step of providing a plurality of furnaces includes spacing apart at least two adjacent ones of the furnaces; and

including the additional step of exposing the fiber to ambient air between the spaced-apart furnaces.

23. The method of claim 9 in which:

the step of providing a plurality of furnaces includes spacing apart at least two adjacent ones of the furnaces; and

including the additional step of enclosing the fiber as it passes between

adjacent ones of the furnaces.

24. The method of claim 9 including the additional step of controlling the degree of carbonization of the fiber by adjusting the residence time within the furnaces.

25. The method of claim 9 including the additional step of forming a biregional fiber having an outer carbonized region and an inner virgin material region by carbonizing only an outer portion of the fiber.

26. The method of claim 25 in which the step of providing a precursor fiber includes providing a bipolymeric fiber containing an inner core of one polymer and an outer sheath of a second polymer that can be carbonized.

27. The method of claim 9 in which the step of providing a precursor fiber includes providing a polyacrylonitrile (PAN) type fiber.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:
Ronald L. Panter

Serial No. 09/780,303 Examiner: P.J. Lish

Filed: 02/09/2001 Group Art Unit: 1754

For: APPARATUS AND METHOD FOR MAKING CARBON FIBERS

CERTIFICATE OF EXPRESS MAIL

I hereby certify that this correspondence is being deposited with the United States Postal Service Express Mail No. EV 395901204 US in an envelope addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on February 13, 2004.

Suzanne J. Wills
Suzanne J. Wills

APPEAL BRIEF

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

ATTENTION: **Board of Appeals and Interferences**

Dear Sir:

1. REAL PARTY IN INTEREST

Industrial Technology and Equipment Company

2. RELATED APPEALS AND INTERFERENCES

None

3. STATUS OF CLAIMS

Claims 1-7, 18, and 19 have been allowed.

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al.

Claims 9, 13-17, 20-24, and 27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al. taken with Uchida et al.

Claims 10-12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al. and Uchida et al as applied to claim 9 and further in view of Berkebile et al (US5316654).

Claims 25, 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al. and Uchida et al and further in view of McCullough (US5700573).

Claims 28-38 have been withdrawn from consideration.

4. STATUS OF AMENDMENTS

The examiner has entered all amendments that the applicant has submitted.

5. SUMMARY OF INVENTION

As recited in claim 8, the invention is a method for making carbon fibers. The method includes providing a precursor fiber (36) and a furnace (10) configured to heat the fiber for both stabilization and carbonization of the fiber. See Specification, page 12, lines 12-15 and page 12 line 20 through page 14, line 21. The fiber is then stabilized and carbonized in a single continuous process that includes drawing the fiber continuously through the furnace by engaging and applying a continuous pulling force to the fiber from outside the furnace. Id.

Claim 9 also recited a method for making carbon fibers. As recited in claim nine, the inventive method includes providing an elongated precursor fiber (36) and a plurality of furnaces (10) disposed adjacent one another in a serial side-by-side relationship, the furnaces being configured to heat the fiber to different respective temperatures as the fiber is drawn through the furnaces. See, e.g., Figure 2; Specification, page 8, lines 32-33 and page 14, line 22 through page 18, line 17. The precursor fiber is stabilized by heating the precursor fiber in an oxidizing environment as it is drawn through respective heating chambers (60, 62, 64, 66, 68, 70 . . .) of an initial group of the plurality of furnaces while applying tension to the precursor fiber. Id. The stabilized fiber is then continuously carbonized by further heating the fiber in an oxidizing environment as it is drawn through the heating chamber of a final one of the plurality of furnaces. Id.

6. ISSUES

Issue 1: Is claim 8 unpatentable over Pepper et al?

Issue 2: Are claims 9, 13-17, 20-24, and 27 unpatentable over Pepper et al. taken with Uchida et al?

Issue 3: Are claims 10-12 unpatentable over Pepper et al. and Uchida et al as applied to claim 9 and further in view of Berkebile et al?

Issue 4: Are claims 25 and 26 unpatentable over Pepper et al. and Uchida et al and further in view of McCullough?

7. GROUPING OF CLAIMS

The grounds of rejection apply to four groups of claims as follows:

Group I: method claim 8;
Group II: method claims 9, 13-17, 20-24, and 27;
Group III: method claims 10-12; and
Group IV: method claims 25 and 26.

8. ARGUMENT (ISSUE 1)

The examiner has rejected claim 8 under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al. According to the examiner, Pepper et al. disclose the claimed process for making carbon fibers except for providing a furnace that includes both a carbonization heating zone and a stabilization heating zone and it would have been obvious to relocate the Pepper et al. carbonization heating zone inside the Pepper et al. furnace that includes stabilization heating zones "to save space and capital costs". The Examiner's position is that using a single furnace for both stabilization and carbonization would be obvious because, according to the examiner, "the rearrangement of locations of parts is obvious to one of ordinary skill." See 15 Aug 2003 OA (Paper #10). As support for this rule the examiner cites *In re* Japikse, 86 USPQ 70.

A more complete statement of the holding in *In re* Japikse is that that there's no invention in shifting the position of a part if *the operation of the device* would not be thereby modified. In view of this, the applicant's initial response to the examiner's line of reasoning was that the *In re* Japikse rule doesn't apply under the present facts. This is because shifting the carbonization heating zone into the same furnace as the stabilization heating zone necessitates changes both in the claimed process and in the operation of the furnace. In addition, it's not just a "part" that's being moved, but the location of an entire step in a process. The examiner responded to this initial argument by stating that "the relocation of the carbonization heating zone from one furnace to another does not change *the process of carbonization.*" Id.

In response to this, the applicant has argued that the holding of *In re* Japikse doesn't require that *every* process recited in a claim, e.g., the process of carbonization, must be changed by the relocation of a part. Even if claim 8 *doesn't* recite a change in the process of carbonization itself, the consolidation of stabilization and carbonization processes into a single furnace does represent a significant change in the overall method for making carbon fibers that the claim recites. The claimed method includes the process of carbonization, but also includes providing a precursor fiber, providing a furnace configured to heat the fiber for both stabilization and carbonization of the fiber, and stabilizing and carbonizing the fiber in a single continuous process that includes drawing the fiber continuously through the furnace by engaging and applying a continuous pulling force to the fiber from outside the furnace. This overall claimed process represents a significant and commercially important change from processes disclosed in the prior art. Rather than simply relocating an electrical switch that merely ***initiates*** a process as in *In re* Japikse, the claimed process consolidates stabilization and carbonization processes into a single furnace.

In addition, *In re* Japikse doesn't require a change of process. Once again, what the *In re* Japikse board held was that there's no invention in shifting the position of a part if *the operation of the device* would not be thereby modified. Here, even if

the process of carbonization hasn't changed, the operation of the device has. Consolidating stabilization and carbonization in a single furnace IS a change in the *operation of the device* because it changes how the device operates. Having adapted a furnace to perform an additional process, one could not accurately say that the operation of the furnace has not changed. The furnace ***was*** used just to stabilize fibers. Now it stabilizes ***and*** carbonizes.

There's no indication that the Board in *In re* Japikse intended that it's holding be used to justify rejections of claims whenever such claims depend for novelty on the repositioning of a process relative to the prior art. While part or process relocations may consistently bring *In re* Japikse to an examiner's mind, it doesn't mean that the rule in *In re* Japikse will always apply or that the relocation of parts or processes can never provide a novel and non-obvious structure or method. It would be inappropriate to extend *In re* Japikse to all situations where, as here, a relocated process hasn't changed. Just because a relocated process hasn't changed doesn't mean that its relocation hasn't changed the operation of the device.

Neither is there any indication that the Board in *In re* Japikse intended that it's holding be used as a *per se* rule of patentability. *Even if* it could reasonably be said that the operation of the device isn't modified by consolidating stabilization and carbonization in a single furnace, "[t]he mere fact that a worker in the art could rearrange the parts of the reference device to meet the terms of the claims on appeal is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for the worker in the art, without the benefit of appellant's specification, to make the necessary changes in the reference device." *Ex parte* Chicago Rawhide Mfg. Co., 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984). The Office Action identifies no such motivation.

The examiner responded to one of the applicant's arguments above by stating that "the relocating of the heating zone does not represent a change in its operation, rather it represents a relocation into a larger enclosed structure." See Advisory Action at page 2. However, the applicant's argument that the examiner appears to be referring to was ***not*** that the relocation of a heating zone represents a change in the heat zone's operation. Instead, the applicant argued that the operation of the entire ***furnace*** has changed to carbonize, as well as stabilize fibers. Therefore, there is no obviousness under *In re* Japikse.

Referring to another of the applicant's arguments, the examiner responds that no change "in operation" is shown, that "it is merely claimed that now a single enclosed structure provides both operations." Id. Here, the examiner has focused the inquiry on whether there has been a change "in operation" rather than in "the operation of the device" as *In re* Japikse requires. The applicant maintains that it is improper to narrow the inquiry to focus on a single operation, e.g., stabilization or carbonization,

that arguably hasn't changed, when the proper inquiry should focus on whether the change modifies the overall operation *of the device*. Again, consolidating stabilization and carbonization ***does*** represent a change in the operation of the device and there is no obviousness under *In re* Japikse.

9. ARGUMENT (ISSUE 2)

The examiner has rejected claims 9, 13-17, 20-24, and 27 under 35 U.S.C. § 103(a) as being unpatentable over Pepper et al. taken with Uchida et al.

Pepper discloses a ***stabilization*** process accomplished using a series of separate furnaces with one or more heating zones. Uchida discloses ***carbonization in an oxidizing process***. The examiner says it would be obvious to combine the two and arrive at the invention of claim 9 (carbonization in an oxidizing process using a series of separate furnaces) because Pepper et al. disclose a stabilization process that may be accomplished using "a series of separate furnaces with one or more heating zones" as recited in claim 9.

The applicant has argued, in response, that to establish a *prima facie* case for obviousness, the examiner must identify either an explicit teaching or at least an implicit suggestion to modify or combine the teachings of the two references. See, *e.g.*, *In re Oetiker*, 24 USPQ2d 1443, 1446-1447 (Fed. Cir. 1992). The examiner, having been unable to identify an explicit teaching to combine these references, has instead identified what he describes as an implicit motivation: "to lower costs by eliminating the need for an additional gas supply." Advisory Action, page 2. The applicant maintains that, rather than showing an implicit suggestion or motivation, the examiner has merely identified an *advantage* that the combination would realize. Identifying an advantage merely shows that, in hindsight, there's an advantage to combining the elements. It does not show an implicit suggestion. If it did, if all that were necessary were to identify an advantage that a combination provides, then almost all patents would be invalid. That's why the Federal Circuit requires that, to show an implicit motivation, an examiner must consider whether one skilled in the art would know to use an existing teaching to solve another problem that's the same as or similar to the problem that the teaching addresses. *Id.* In other words, when there is no explicit suggestion, then, to show that there's an implicit suggestion, the Examiner must show that one skilled in the art would know to use a prior art teaching to solve the problem that the Applicant seeks to solve through the invention in question. For this to be the case, the problem that the invention solves must be the same as or similar to the problem that the prior art teaching solves. See *Id.*

In a telephone interview conducted 21 January 2004, I asked for the examiner's position on whether the problem that the invention solves is the same as or at least similar to the problem that the prior art teaching solves. Before beginning the telephone interview, I forwarded to the examiner the applicant's position with regard to this issue: that the problem that the invention of claim 9 solves by using the combination of a series of separate furnaces and an oxidizing atmosphere, is the problem of how to provide a

continuous precursor fiber ***carbonizing*** process (rather than a batch process). App. p.3, lines 16-18. The problem that the Pepper proposes to solve with a series of separate furnaces is the problem of how "to establish a series of temperature stages" (Col. 6, lines 3-5). This is offered as an alternative to a multi-zone gradient furnace in an already continuous process – so the reference doesn't suggested it as a way to solve the problem of how to make a non-continuous process continuous. Uchida mentions carbonization (calcinations) in an oxidizing atmosphere only as an alternative way to solve the problem of how to carbonize carbon performs (Col. 6, lines 9-12). The applicant maintains that, although claim 9 incorporates each of these concepts, the problems that the prior art features solve are neither the same nor similar to the problem of how to continuously carbonize precursor fiber. As such, there is no implicit motivation and, under *In re Oetiker*, there is no basis for a finding of obviousness.

In response, the examiner's supervisor, who was present with the examiner for the telephone interview, rather than providing an alternative analysis based on *In re Oetiker,* denied that the examiner was required to follow the test in *In re Oetiker*. The examiner's supervisor cited In re Dillon 16 USPQ2d. 1897 (Fed. Cir. 1990)(en banc) as standing for the proposition that, contrary to In re Oetiker's holding, the prior art doesn't need to solve the applicant's problem to show an implicit motivation to combine. When I asked whether he was contending that In re Dillon reversed In re Oetiker, the Examiner's supervisor said no, but that "these decisions are all over the map" and they, as examiners, just had to select whichever case supports their position. I suggested that, by abandoning what appears to be a more objective test for determining whether there's an implicit suggestion, the examiner's supervisor has opted for a system where examiners just go with their subjective gut feelings as to whether a combination would have been obvious.

In addition, the applicant notes that *In re Dillon* pre-dates *In re Oetiker*. As such, the applicant understands the principle of *stare decisis* in this situation to preclude an examiner from relying on even an *en banc* decision of the Federal Circuit to nullify a Federal Circuit holding in a subsequent case (*In re Oetiker*). Still further, having reviewed the Federal Circuit's *en banc* decision *In re Dillon*, I can find nothing that contradicts the rule the Federal Circuit later established in *In re Oetiker*. In fact, in *In re Dillon*, the court clearly states that it "reaffirms that structural similarity between claimed and prior art subject matter, proved by combining references or otherwise, where the prior art gives reason or motivation to make the claimed compositions, creates a *prima facie* case of obviousness . . ." *In re Dillon* at 1901. This statement harmonizes easily with the subsequently developed rule in *In re Oetiker* regarding how an examiner should go about showing that there is an implicit motivation to combine, i.e., by evaluating whether the problem that the invention solves is the same as or similar to the problem that the prior art teaching solves.

10. ARGUMENT (ISSUE 3)

The examiner has rejected claims 10-12 as being unpatentable over Pepper et al. and Uchida et al as applied to claim 9 and further in view of Berkebile et al. The applicant maintains that claims 10-12 are allowable because they depend from an allowable base claim.

11. ARGUMENT (ISSUE 4)

The examiner has rejected claims 25, 26 as being unpatentable over Pepper et al. and Uchida et al and further in view of McCullough. The applicant maintains that claims 25 and 26 are allowable because they depend from an allowable base claim.

A check for $1,280 to cover the appeal brief fee is enclosed. However, the Commissioner is authorized to charge any fee or credit any overpayment in connection with this communication to our Deposit Account No. 50-0852. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

REISING, ETHINGTON, BARNES, KISSELLE, P.C.

Eric T. Jones, Reg. No. 40,037
Attorney of Record
P.O. Box 4390
Troy, Michigan 48099-4390
(248) 689-3500

Date: February 13, 2004

12. APPENDIX

1. A method for making carbon fibers, the method including the steps of:

providing a precursor fiber;

providing a furnace configured to heat the fiber;

stabilizing the precursor fiber by heating the precursor fiber in an oxidizing environment in a heating chamber of the furnace while applying tension to the precursor fiber;

carbonizing the stabilized fiber by further heating the fiber in an oxidizing environment in the heating chamber of the furnace.

2. The method of claim 1 in which the steps of stabilizing and carbonizing each include:

continuously introducing ambient air into the furnace;

heating the air; and

blowing the heated air over the fiber in the heating chamber of the furnace.

3. The method of claim 1 in which the step of stabilizing includes:

initially heating the precursor fiber until reaching a heating chamber temperature of between approximately 174 and 185 degrees Celsius;

holding the heating chamber at this temperature for approximately 5 minutes until the material begins to stabilize;

after the precursor material begins to stabilize, raising the heating chamber temperature approximately 1.7-2.8 degrees Celsius per minute to approximately 204 degrees

Celsius by increasing the temperature of the heated air being blown into the heating chamber; then

gradually raising the heating chamber temperature from approximately 204 degrees Celsius to approximately 227 to 232 degrees Celsius by increasing the temperature of the heated air being blown into the heating chamber at a rate sufficient for stabilization but insufficient for carbonization; and

the step of carbonizing includes:

quickly raising the heating chamber temperature to approximately 399 degrees Celsius by increasing the temperature of the air being introduced into the heating chamber at a rate that will carbonize the fiber.

4. The method of claim 1 in which the step of carbonizing includes carbonizing the fibers such that each resulting fiber is a biregional fiber that includes an inner non-carbonized core and an exterior carbonized sheath.

5. The method of claim 4 in which:

the step of providing precursor fibers includes providing a homogeneous polymeric material;

the step of stabilizing includes oxygen stabilizing an outer fiber portion of the polymeric material; and

the step of carbonizing includes forming a carbonized outer region and a non-carbonized inner region of each fiber.

6. The method of claim 5 in which the step of providing a homogeneous polymeric material includes providing a standard acrylic polymer.

7. The method of claim 1 in which the step of providing a precursor fiber includes providing a polyacrylonitrile (PAN) fiber.

8. A method for making carbon fibers, the method including the steps of:

providing a precursor fiber;

providing a furnace configured to heat the fiber for both stabilization and carbonization of the fiber; and

stabilizing and carbonizing the fiber in a single continuous process that includes drawing the fiber continuously through the furnace by engaging and applying a continuous pulling force to the fiber from outside the furnace.

9. A method for making carbon fibers, the method including the steps of:

providing an elongated precursor fiber;

providing a plurality of furnaces disposed adjacent one another in a serial side-by-side relationship and configured to heat the fiber to different respective temperatures as the fiber is drawn through the furnaces;

stabilizing the precursor fiber by heating the precursor fiber in an oxidizing environment as it is drawn through respective heating chambers of an initial group of the

plurality of furnaces while applying tension to the precursor fiber; and

continuously carbonizing the stabilized fiber by further heating the fiber in an oxidizing environment as it is drawn through the heating chamber of a final one of the plurality of furnaces.

10. The method of claim 9 in which the step of stabilizing the precursor fiber includes:

heating the heating chamber of a first one of the plurality of furnaces to a first temperature;

heating the heating chamber of each subsequent furnace to a temperature higher than each respective preceding furnace;

heating the heating chamber of one of the furnaces to a temperature less than and approximating the flash point of the precursor fiber being stabilized; and

drawing the fiber through the heating chambers of the furnaces starting with the heating chamber of the first furnace.

11. The method of claim 10 in which the step of providing a plurality of furnaces includes configuring the furnaces such that the fiber is exposed to a temperature just below and approximating the flash point of the fiber for a longer period of time than the fiber spends at the other temperatures.

12. The method of claim 11 in which the step of providing a plurality of furnaces includes:

providing an additional furnace adjacent the furnace that is heated to a

temperature just below the flash point of the precursor fiber being stabilized;

heating the additional furnace to a temperature just below and approximating the flash point of the precursor fiber being stabilized; and

drawing the fiber through the furnaces such that the fiber passes through the heating chamber of the additional furnace after leaving the heating chamber of the furnace that is heated to just below and approximating the flash point of the fiber.

13. The method of claim 9 in which the step of carbonizing the fiber includes:

heating the heating chamber of a final one of the furnaces to a temperature that will carbonize at least a portion of the fiber; and

drawing the fiber through the heating chamber of the final furnace.

14. The method of claim 9 in which:

the step of providing a plurality of furnaces includes providing seven furnaces connected in series; and

the step of stabilizing the precursor fiber includes:

heating the heating chamber of the first furnace to approximately 185 degrees Celsius;

heating the heating chamber of the second furnace to approximately 193 degrees Celsius;

heating the heating chamber of the third furnace to approximately 204 degrees Celsius;

heating the heating chamber of the fourth furnace to approximately 216 degrees Celsius;

heating the heating chambers of the fifth and sixth furnaces to approximately 232 degrees Celsius; and

drawing the fiber through the heating chambers of the first, second, third, fourth, fifth, sixth, and seventh furnaces in sequence.

15. The method of claim 14 in which the step of carbonizing the fiber includes:

heating the heating chamber of the seventh furnace to approximately 260 degrees Celsius; and

drawing the fiber through the heating chamber of the seventh furnace.

16. The method of claim 14 including the additional step of drawing the fiber through the furnace heating chambers at a rate that provides a residence time in each furnace of approximately 0.6 minutes.

17. The method of claim 15 including the additional step of introducing ambient air into each furnace.

18. A method for making carbon fibers, the method including the steps of:

providing an elongated precursor fiber;

providing at least seven furnaces disposed adjacent one another in a serial

side-by-side relationship, connected in series, and configured to heat the fiber to different respective temperatures as the fiber is drawn through the furnaces;

introducing ambient air into each furnace;

heating the heating chamber of the first furnace to approximately 185 degrees Celsius;

heating the heating chamber of the second furnace to approximately 193 degrees Celsius;

heating the heating chamber of the third furnace to approximately 204 degrees Celsius;

heating the heating chamber of the fourth furnace to approximately 216 degrees Celsius;

heating the heating chambers of the fifth and sixth furnaces to approximately 232 degrees Celsius; and

stabilizing the precursor fiber by heating the precursor fiber in an oxidizing environment as it is drawn through the respective heating chambers of the first, second, third, fourth, fifth, and sixth furnaces in sequence while applying tension to the precursor fiber;

heating the heating chamber of the seventh furnace to approximately 260 degrees Celsius;

continuously carbonizing the stabilized fiber by further heating the fiber in an oxidizing environment as it is drawn through the heating chamber of the seventh furnace; and

adjusting downward the amount of ambient air introduced into furnaces that

are operating at and above approximately 232 degrees Celsius.

19. The method of claim 18 including the additional step of restricting the airflow in furnaces operating at and above 232 degrees Celsius to approximately 60 percent (by volume) of the airflow in the furnaces operating below 232 degrees Celsius.

20. The method of claim 9 including the additional step of further graphitizing the fiber by adding additional furnaces operating at higher temperatures.

21. The method of claim 9 including the additional step of adjusting fiber draw rate to optimize the stabilization and carbonization processes.

22. The method of claim 9 in which:

the step of providing a plurality of furnaces includes spacing apart at least two adjacent ones of the furnaces; and

including the additional step of exposing the fiber to ambient air between the spaced-apart furnaces.

23. The method of claim 9 in which:

the step of providing a plurality of furnaces includes spacing apart at least two adjacent ones of the furnaces; and

including the additional step of enclosing the fiber as it passes between

adjacent ones of the furnaces.

24. The method of claim 9 including the additional step of controlling the degree of carbonization of the fiber by adjusting the residence time within the furnaces.

25. The method of claim 9 including the additional step of forming a biregional fiber having an outer carbonized region and an inner virgin material region by carbonizing only an outer portion of the fiber.

26. The method of claim 25 in which the step of providing a precursor fiber includes providing a bipolymeric fiber containing an inner core of one polymer and an outer sheath of a second polymer that can be carbonized.

27. The method of claim 9 in which the step of providing a precursor fiber includes providing a polyacrylonitrile (PAN) type fiber.